Education, International - Bibliography

NOVEMBER 1959 - VOLUME XI - N°9

Education abstracts

THE UNIVERSITY OF MICHIGAN
FEB 8 1960
EDUCATIONAL READING ROOM

The teaching of mathematics

by G. Mialaret

unesco

PREVIOUS ISSUES

Vol. X		
6	June 1958	*Education in Israel*
7-8	September-October 1958	*Rural education*
9	November 1958	*Education in Brazil*
10	December 1958	*Selected Educational Periodicals*
Vol. XI		
1	January 1959	*School furniture and equipment*
2	February 1959	*Physical education: official primary and secondary programmes*
3	March 1959	*Adult education and leisure-time activities in Czechoslovakia*
4-5	April-May 1959	*Textbooks and international understanding*
6	June 1959	*Education in Italy*
7	September 1959	*The education of girls for citizenship*
8	October 1959	*Adult education in community development*

Education Abstracts is published every month except July and August
Annual subscription: $2.00; 10/-(stg.); 6 NF
Single copies: $0.25; 1/3(stg.); 0,75 NF

Any of the distributors listed on page 4 of the cover will be pleased to accept subscriptions; rates in currency other than the above will be supplied on application to the distributor in the country concerned. When notifying change of address, please enclose last wrapper or envelope.

Unesco publications abstracted in this journal may be obtained from the national distributors, listed on page 4 of the cover, or, if necessary, from Unesco House, Place de Fontenoy, Paris 7e. Orders for other items should be addressed to booksellers or to the originators of the material.

Field workers, research students and others engaged or interested in education are invited to send in to the Education Clearing House, Unesco, documents, textbooks and other technical materials for possible inclusion in the Abstracts. Critical comments and suggestions will also be most welcome as a means of improving our service.

Other Unesco publications in the field of education include:

EDUCATIONAL STUDIES AND DOCUMENTS
(series in English and French, and, for the titles preceded by an asterisk, in Spanish)

*25. *The New Zealand school publications branch*
*26. *Psychological foundations of the curriculum*
27. *Technical and vocational education in the United Kingdom*
*28. *Curriculum revision and research*
*29. *Teaching about the United Nations and the Specialized Agencies: a selected bibliography*
30. *Technical and vocational education in the USSR: a selected bibliography*
*31. *An international bibliography of technical and vocational education*
32. *Methods of school enrolment projection*
33. *Secondary technical and vocational education in underdeveloped countries*
*34. *An international directory of education associations*

FUNDAMENTAL AND ADULT EDUCATION (a quarterly bulletin, in English and French editions)
Short accounts of experiments, field work and materials used.
Annual subscription: $1.50; 7/6(stg.); 4,50 NF

ED. 59. XI. 113 A

Printed in November 1959 in the Workshops of Unesco
Place de Fontenoy - Paris 7e - France
© UNESCO 1960

The teaching of mathematics

by G. Mialaret

unesco

PREFACE

The present issue of **Education Abstracts** *on the teaching of mathematics was prepared for the Secretariat by Professor Gaston Mialaret, of the University of Caen.*

The Secretariat wishes to take this opportunity of thanking Professor Mialaret for his valuable assistance.

The author and the Secretariat feel that a few explanations are necessary regarding the choice of works listed. They would first of all like to thank the International Bureau of Education in Geneva and its distinguished Director, Professor Rossello, for making reference works available to them and for authorizing them to reproduce certain abstracts. However, some selection had to be made from the very copious literature on the subject. Generally speaking, apart from works of outstanding importance, the bibliography lists no works prior to 1950 and is brought up to about Easter 1959. With one or two exceptions, articles have been excluded in order to concentrate entirely on full-length books. Those dealing with too limited an aspect of the subject or with purely practical problems without broaching questions of method were rejected in favour of books in which teaching methods were generally taken into account.

INTRODUCTION

The universal importance attached to the teaching of mathematics needs no stressing today.

All countries without exception are seeking a rational and effective solution to this intricate and highly important problem. Present-day civilization sets man baffling problems which now call for more than merely verbal solutions; contemporary society needs technicians who themselves must be grounded in mathematics. The problem is pressing, and the great countries in the van of scientific and technological progress have made considerable efforts to promote mathematics teaching. It can be safely asserted that on this score all countries in the world - from the greatest to the smallest, from the most advanced to those regarded as being in the development stage - are unanimous. There is no question of excising the teaching of the humanities from the secondary school curriculum; what is needed is recognition of the important place that must be given to all those studies which are the taproot from which the headlong progress of modern science and technology derives. Literary studies - which we hope, will go on playing an important part in our educational systems - have failed to provide a solution to the vital problems of today - a solution capital for the future development of all mankind. The same set of problems has produced the same reactions in the various countries, which are giving close attention to scientific teaching and trying to increase its scope and effectiveness. It is true to say that mathematics teaching has not yet been developed to the full, and that many young people unfortunately turn aside from mathematics to go in for literary subjects, not because of any particular gift but merely in order to avoid the troublesome consequences of having no so-called "flair" for the subject.

It is not surprising, therefore, to find the same questions constantly cropping up in the specialist literature of every country: and they will fittingly serve as headings in this brief introduction.

What aims should be pursued in secondary education and what subjects should be taught?

What psychological processes are involved in elementary training in mathematics and what are the latest findings of psychological studies in this field?

What should be the approach to the mathematics teaching in the light of these findings and of curricular requirements?

What are the most suitable school arrangements and the most effective teaching methods?

All these questions presuppose the existence of teachers, which brings us to the crucial question of the recruitment and training of mathematics teachers.

The final task will be to consider the studies which have been made on the assessment of results, as well as the experimental education work which is now throwing fresh light on the issue before us.

I shall use the same classification of aims assigned to mathematics teaching as was adopted by the International Bureau of Education in its survey on the subject. (a) Educational aims; (b) General education aims; (c) Practical aims; (d) Preparation for studies at higher level.

Educational aims. Mathematics is a subject which calls for great concentration, observation, exactitude and perseverance, and is therefore of first-rate importance from an educational point of view, since its study inculcates habits of industry, mental discipline and a sense of objectivity. Specifically, however, its aim is to cultivate aptitudes such as the capacity for abstract thinking, conciseness in the use of words, logical reasoning, the analytical and research approach, critical judgement and a scientific turn of mind. The object of mathematics teaching, in short, is to cultivate and foster moral and intellectual faculties contributing to the development of personality.

General education aims. Mathematics forms part of general education, and its aims at secondary level are therefore part and parcel of those of secondary education as a whole. Mathematics rightly ranks as a major subject in secondary curricula because of the cultural enrichment it produces. Mathematics can be taught in conjunction with other subjects and helps the pupils to understand other subjects for which it is an essential tool, such as physics and engineering. It helps them to grasp and interpret phenomena in terms of quantitative language, and to realize the important part played by the exact sciences in everyday life and in science proper. By giving practice in abstract thinking, it develops a faculty which is one of the hallmarks of sound education: the ability to express general concepts in symbolic form.

Practical aims. Under modern conditions, it is essential to have a certain minimum of mathematical

knowledge in order to cope with everyday problems of living, and this can only be acquired in the course of secondary education. It also provides the basis for an increasing number of professional activities. Skill in calculation and ability to interpret graphs and statistical data or economic problems are no longer the preserve of specialists: we might even venture to state that a mathematical grounding is an essential part of civic training.

Preparation for studies at higher level. One of the aims of mathematics teaching at secondary level is to lay a sound basis of mathematical knowledge for students intending to follow scientific or technical studies at higher level. It is clear, seen from this angle, that mathematics teaching is important for future scientists as it also is for future specialists in philosophy (logistic, for example) or social sciences (statistics, theory of information and so on).

With the above headings as a guide, the problems involved in the choice of syllabuses become more clearly apparent. The question can be seen to have three aspects, each of which gives rise to - sometimes heated - discussion.

The syllabuses should be such as to enable mathematics to be correlated with everyday life while still retaining its value as a form of intellectual training. There are two opposite schools of thought on this point: the formalist and the pragmatic. One side regards mathematics as a training in precision and abstract reasoning, while the other, while not denying the value of mathematics as a school of logic, attaches greater importance to its practical applications, the fields in which it can be used and the mastery of the rules which will yield the best results. It is often in this guise that the battle is waged between the respective advocates of "general" and "technical" education in countries where technical education is organized as a branch of education in its own right. Syllabuses vary between these two extremes - the study of mathematics for its own sake or for the practical uses to which it can be put - according to the country, its level of development and the philosophy underlying its system of education.

Another problem arises when secondary schooling is considered as a stepping-stone to higher education: namely, that of whether pupils should be given a grounding in classical (Euclidean) mathematics or whether they should be introduced to modern schools of thought and axiom-formulation problems and launched on the study of recent disciplines such as statistics. In some countries the syllabuses include modern techniques from the initial stage, whereas in others they come in only at the university level. Momentous changes are at present taking place, and although their general trend is already discernible it is still impossible to say what methods will be adopted in future, despite some clear pointers.

The fact is that other considerations relating to the pupil himself must be taken into account before we start laying down the law regarding syllabuses and methods. The needs of society obviously impose requirements which the syllabuses must meet; but it is equally true that these syllabuses cannot be used unless they are within the pupils' psychological capacity. It is therefore essential, having reached this juncture, to examine some of the work being done in this field.

In view of the difficulty of providing even the briefest survey of the psychological problems involved in elementary grounding in mathematics, I shall confine myself to a few summary remarks.

Mathematics is one of the fields in which the clash between two mentalities - two ways of thinking - comes out most clearly. We are dealing with children who have mastered the main rules of social conduct at the age of about ten or eleven and are already well adjusted to the world in which they live. But no sooner are we accustomed to seeing them react in the same way as ourselves than we find, when it comes to mathematics lessons, that the attunement is suddenly broken.

What appears self-evident, sometimes easy and always logical to us is no longer so for the pupils. The teacher, afflicted by "infantile amnesia", forgets all the difficulties he may once have encountered himself and straightaway wants to impose his own patterns of logical thought on the pupil, to whom they are not only dull but pointless. Result: conflict.

On top of this is the fact that where other subjects are concerned, such as the mother tongue, history and the natural sciences, the difference between primary and secondary school instruction is merely one of degree. But the foreign languages taught in the first year of the secondary school, and especially the mathematics taught in the second year, are almost entirely new subjects. The difference here is "qualitative". This sharpens the antithesis and makes it incumbent on the adult to make allowance for the child's inability to grasp the new concepts.

The importance of affective problems. What stands out is the importance of affective factors in the early teaching of mathematics, which more than any other subject represents the field of pure logic. It is perhaps because this truth is overlooked that mathematics teaching so often ends in failure.

In my view, the first thing with mathematics, more than with other subjects, is to base teaching methods on the principle that nothing succeeds like success. All too often, the pupils who are weak in mathematics are those who have never

been able to master its problems. The situation created by having to deal with a mathematical symbol or problem has a traumatic effect on them, leaving them with a mental inhibition which amounts to a virtual conditioning. Many such pupils acquire what is popularly described as a "phobia about mathematics" which is the keynote to their behaviour throughout their secondary studies.

It should also be borne in mind that adolescence is not a particularly suitable time for purely logical studies. Many young people find that mathematics does nothing to meet their emotional needs, besides which it presents itself as an intrusion by the adult in a position to control the pupil's mental activity.

Again, quite apart from the other factors mentioned, mathematical language creates a feeling of insecurity, the main symptoms of which revolve around an inhibition rather like the "stage fright" felt by certain actors. At about 10 or 12 years of age, the child reaches a particular stage in the mastery of language and is capable of expressing - albeit clumsily and artlessly - his thoughts and feelings. In the first lessons in mathematics, there is repeated stress on the need for using new formulae - of a strange or incomprehensible kind, to say the least (isoceles and equilateral triangles, etc.) - and the young pupil comes up against a terminology which he is acutely aware of not knowing properly or being able to handle with sufficient confidence. If the teacher, as so often happens, demands near-perfection in the very first exercises in mathematics, the pupil is overwhelmed by a task which is beyond him - that of thinking over the problem and understanding it as a whole and at the same time finding suitable verbal formulae for expressing exactly what he grasps only dimly. Instead of helping the young pupil, through a kind of self-discipline conducive to his psychological development, to advance from an overall view of the factors involved in the reasoning process to an increasingly logical and precise grasp of the way these factors dovetail, the teacher promptly douses the glimmering light of understanding with a blanket of new terms not properly suited to the child's stage of mental development. The formulae used permit only an imperfect rendering of what the child understands, and the result is to set up a discordance. This sense of discomfort, due to wrong teaching methods, produces an inhibition in the child, who ends up by not daring to reply to the teacher and lapses into disconcerting silence. For him, mathematics has become an alien language.(1)

Understanding and knowing. These special forms of mathematical language are partly responsible for another difficulty which the teacher's lack of insight serves to aggravate: the establishment of a distinction between "knowing" and "understanding". All too often, as pointed out, the pupils' minds are enveloped in a verbal blanket before they have even managed to obtain a real grasp of the problem. And for them the blanket will become the substance of the lesson, and all too often the only thing they will learn will be the words. And even these words, these magic formulae, will soon be forgotten if the teacher fails to repeat them over and over again. In that case, he will find that his pupils, who seemed to have understood what he had explained to them and had even correctly repeated the demonstration of a theorem or the answer to a problem, will a few days later be incapable of recapitulating the same work or of giving the right answers.

And so the teacher will lose patience with these pupils who cannot rediscover the logical processes of reasoning. The result is a conflict between teacher and pupils; and it is easy to understand why so many adults accuse their former mathematics teachers, rightly or wrongly, of not having understood them, of having driven them too hard, of being responsible for their poor showing in mathematics. There is a crass disparity between the mental approach of the mathematics teacher who has completely assimilated the concepts he is teaching and is therefore able to refresh his memory if he has forgotten them, and that of the pupil who has not yet integrated these concepts into a system of thought sufficiently well-developed to be able to dispense with verbal formulae learnt more or less by rote.

Where teacher and pupils have no particular liking for each other, the teacher will label them complete dunces in the logical sciences, and they, for their part, will acquiesce (resignedly or not) in his verdict: they have no "flair for geometry", and that is all there is to it. And they will compensate by convincing themselves of their artistic "superiority". Contempt for the natural sciences may thus develop among young people while they are still in the full process of adolescence.

Proper progress. Another all too common failing on the part of the teacher is omission of certain steps in reasoning - the first ones, usually, because they seem so easy and obvious to him that he sees no need to labour them. The brighter pupils have no trouble in filling in the gaps and reconstructing the whole chain of reasoning, but the weaker ones get out of their depth and never again manage to find their feet.

To take an example, geometry teaching proceeds from the assumption that the logical principles on which reasoning is based are already implanted in the pupil's mind, whereas what is really needed is an attempt, by means of concrete examples, to instil and develop those principles, which are primordial for any work in mathematics.

It is no paradox to state that it is mathematics, the most logical of all subjects, which calls for

(1) Mialaret, G. Quelques aspects affectifs de l'enseignement des mathématiques. Paper presented at the Journées de Psychologie de l'Enfant, Paris, 1954.

the greatest regard by the teacher for the pupils' psychological difficulties and affective problems.

And this brings us, perhaps, to one of the several aspects of teacher training, as will be seen below.

With these considerations in mind, the methods, techniques and procedures used for teaching mathematics can now be effectively discussed. To avoid overburdening this brief introduction and converting it into a course in teaching methods, I shall merely list the major present-day problems; and to that end, I need only recapitulate the excellent recommendations made by the XIXth International Conference on Public Education - a remarkable "digest" in themselves of the teaching methods to be used for mathematics.

Every effort should be made to stimulate and encourage pupils in the learning of mathematics in an active way through personally participating as much as possible in the elaboration of the subject.

It is essential:

(a) To awaken and maintain the pupils' interest in both pure and applied mathematics;
(b) To pay attention to the pupils' own way of thinking in mathematics;
(c) To adapt teaching to the pupils' individual capacities and intellectual growth, and gradually to differentiate it in accordance with their intended future activities.

It is essential:

(a) To proceed, where possible, from the concrete to the abstract, especially in the lower classes, and whenever possible to make use of real, figurative or imagined experimentation in order to suggest definition or demonstration;
(b) To take into account that mathematical knowledge is engendered and grows through the interiorization of concrete activity and the organization of operational schemes;
(c) To take advantage of questions raised by concrete situations, not merely to show the practical value of mathematics but especially to motivate theoretical developments.

It is important:

(a) To lead the pupils to formulate ideas and discover mathematical relations and properties for themselves, rather than impose on them ready-made adult thinking;
(b) To ensure the assimilation of ideas and operational processes before beginning formal training;
(c) To make only assimilated operations into automatic skills.

It is essential:

(a) To give pupils experience of mathematical entities and relations first, and then introduce them to deductive reasoning;
(b) To extend the deductive construction of mathematics gradually;
(c) To train pupils to raise problems, to search for and utilize data, and to evaluate results;
(d) To give preference to the heuristic investigation of questions, rather than to the doctrinal teaching of theorems;
(e) To make pupils conscious of the structure of a hypothetical deductive theory in which, on the basis of postulates, the theorems are built up by demonstrations and new terms are introduced by definitions, leading them to a deductive logical treatment.

It is necessary:

(a) To study the mistakes pupils make, and to see in them a means of getting to know how the pupils think mathematically;
(b) To train pupils to exercise personal control and self-correction;
(c) To give pupils a sense of approximation, order of magnitude, and reasonableness of results;
(d) To give preference to reflection and reasoning rather than to mere drilling and learning by heart, and to limit the rôle of memory to fundamental results;
(e) To set examination papers requiring more mathematical skill than mere cramming.

It is important:

(a) To encourage personal ways of expression, even if they are only approximate, and improve them gradually;
(b) To lead pupils towards precision and exactitude through their need to communicate effectively with other persons and to clarify their thoughts;
(c) To foster individual research and initiative as much as team work;
(d) To increase the number of pupils interested in mathematics and to assist in developing their aptitudes and knowledge by organizing clubs, lectures, competitions and other activities of an optional nature and by providing them with the books and periodicals appropriate for them.

It is essential:

(a) To give emphasis to the intrinsic unity of mathematics, not to put its various branches into watertight compartments, and to bring the various methods of resolution of a given problem together;
(b) To indicate the main stages in the historical growth of the mathematical ideas and theories being studied.

It is essential:

(a) To maintain the co-ordination of mathematics with the sciences which make use of mathematics;
(b) To utilize the requirements of mathematical thought in order to increase the accuracy, the clarity and the conciseness of language;
(c) To keep the link intact between mathematics, on the one hand, and life and reality, on the other.

Teaching materials. The evolution of the methodology of mathematics calls for an adaptation of textbooks. Besides books on the initiation to mathematics which permit the progressive

acquisition of abstract ideas, the pupil should be able to have access to books of revision where the subject matter acquired is resumed and organized on a higher level. Books of reference, supplementary material, popular handbooks, periodicals etc. should be available in every class library. This documentation should be adapted to the aims of the different sections and, in each case, it should respect the proper ratio between the practical point of view, technical needs, theoretical development and concern for culture.

As audio-visual aids, concrete mathematical models (taken from daily life, constructed by the pupils or the teachers, or manufactured by commercial firms) play a larger and larger part in teaching, it is desirable to take advantage of their use to enable the pupils to acquire mathematical abstractions actively.

In mathematics, perhaps more than in other subjects, the rôle of the teacher is of prime importance. The recruitment, training and further training of mathematics teachers should be the object of special attention and solicitude by the authorities responsible for the education of the young.

Teachers entrusted with the teaching of mathematics in secondary schools should have studied mathematics at a level considerably beyond that to which they will be required to teach. These studies should include not only theoretical mathematics but also some applied mathematics, an outline of the history of mathematical thought, the methodology of mathematical science itself and the study of elementary mathematics considered from a higher point of view.

Adequate professional and psychological training should be regarded as a necessary complement of the teacher's mathematical studies and should be based on clear and mature understanding of the objectives and principles of humanistic education. It should give emphasis to the structural evolution of intelligence in relation to the elaboration of mathematical thought, and should include the relations of the concrete and the abstract in such a way as to give a proper place to the methodology of models in mathematics teaching. The prospective teacher should be trained to observe and experiment in the teaching of mathematics. Above all, he should be interested in adolescents and their aspirations and thus enabled to act as their leader and guide.

Care should be taken to ensure that all pupils in the earlier years and the less able pupils in the later years are taught by good teachers.

Serving mathematics teachers should be in a position to keep abreast of modern developments in the theoretical mathematical sciences, important present-day applications of mathematics and recent advances in the teaching of the subject. Steps should be taken to facilitate teachers' further training by lectures, vacation courses, seminars, workshops, practical courses, publications etc.

Suggestions from specialist supervisors and educational advisers, and the example of the work of experienced teachers, are excellent means of raising the efficiency of teaching.

In modern society secondary mathematics teachers should enjoy the esteem and standing to which their scientific studies and their vocation entitle them.

The adequate teaching of mathematics being an essential part of education in all countries, the teaching profession must attract sufficient qualified teachers in this subject. This is of special importance since an adequate supply of mathematics teachers governs the scientific, technical, economic and social development of all nations.

It still remains to consider the progress made as far as psychological and educational research into mathematics teaching is concerned. Three complementary developments for promoting teaching efficiency are discernible. There has been a great deal of research into the faculties required for assimilating mathematics. Factorial analysis methods are very often used to single out the component elements of the mathematical approach or, to put it more simply, of mathematical reasoning. These studies are particularly useful and valuable for certain selection and guidance tests: there are tests, in fact, where the saturation rate for a particular factor is fully determined, thus yielding reliable guidance data.

Direct studies of logical reasoning have also been made, the best-known author on this subject being J. Piaget, whose clinical-type research provides a picture of the successive structures characterizing the adolescent's thinking during his early grounding in mathematics. Once he becomes capable of formal thinking he has reached a sufficient degree of maturity to be able to derive profit from mathematics lessons and exercises.

Lastly, a new field now beginning to be prospected is what we might describe as educational psychology, since the research being done in that direction is wholly concentrated on psychological problems in relation to applied teaching methods. The laboratory for this research is the classroom itself, and the studies bear on the actual methods used by the teacher. They take account of the entire set of factors whereby the general educational process can be described and explained - pupil, class, social background, teacher, equipment available to teachers, syllabuses, methods etc. This tends towards a form of experimental teaching permanently allied with educational practice, the psychological data obtained being valid only for the school conditions under which they were assembled. Promising results may be expected from the current work, which certainly provides a line of advance which

augurs well for mathematics teaching and educational psychology research.

The present status of mathematics teaching in general is thus difficult to define with any precision, for during this period of swift changes all conclusions are hazardous. All we can do is to make conjectures on the basis of the major present-day trends and the dynamic changes taking place in teaching methods.

Mathematics are being restored to their place of honour not only as a tool of intellectual training but also as a tool needed by twentieth-century man if he is to understand the surrounding world, which he must learn to master. Mathematics teaching is closely bound up with the progress of modern civilization and is at the same time undergoing a radical change under the impact of the great mathematical discoveries. The very content of teaching is in a state of flux.

As far as the pupil himself and psychological problems are concerned, due account is being taken of the adolescent's special difficulties in the intellectual sphere and also of the other non-intellectual factors - the affective and social ones. Mention may also be made, in this connexion, of research on re-education, whose object is to improve all-round scholastic results through the application of special methods (still being perfected) to intelligent children failing to obtain good results in mathematics.

In other words, we are now exploring every avenue and exploiting every possibility of increasing mankind's mathematics potential. But it is to be hoped that the added possibilities opened up in the field of mathematics and science will not leave man stranded, like the sorcerer's apprentice, with only half the knowledge he needs. This development of human capital must be for us a means of mastering the forces of nature that we are now learning to release, and of placing them in the service of man so as to make the world a better place for every one of us to live in.

GENERAL

1. XIXth International Conference on Public Education, Geneva, 1956. Teaching of mathematics in secondary schools; comparative study. Paris, Unesco; Geneva, International Bureau of Education, 1956. 249 p. (Publication no. 172). Also published in French.

This study, which in some respects is a logical sequence to the volume published in 1950 on the introduction to mathematics in primary schools, is based on information supplied by sixty-two countries, and deals with the following points: place of mathematics in curriculum, aims of mathematics teaching, methods of teaching mathematics (directions on methods, transition from primary to secondary education, textbooks and teaching materials), and teachers (training of mathematics teachers, facilities for further training, supply problems).

BELGIUM

2. Belgique. Direction générale de l'enseignement moyen. Les modèles dans l'enseignement mathématique. Bruxelles, Ministère de l'instruction publique, n.d. 115 p. (Documentation cahier n° 5).

Presentation of some mathematical models shown at a teaching aids exhibition during the 3rd Congress of the Belgian Society of Mathematics Teachers, a congress which was organized at Berchem in 1952 to discuss "the concrete and intuitive sources of mathematics". Included in the book are articles illustrating certain aspects of the exhibition and of the Berchem congress.

3. Marchal, Renée. Les mensurations psycho-pédagogiques: III. La géométrie. Louvain, Université catholique, Laboratoire de pédagogie expérimentale, 1956. 280 p.

After having defined the characteristics of geometry and determined the general lines of the course and of modern methods, the author turns to a descriptive, analytical and critical study of different geometric tests: tests of aptitude and of knowledge acquired, "instructional" tests, diagnostic and practical tests. It is extremely difficult to appraise aptitude for reasoning, and research carried out up to the present aims chiefly to measure aptitude to visualize mentally certain elements of spatial and plane geometry as well as to memorize and understand definitions and basic ideas. These tests will be used in connexion with systematic observation and the analysis of written and oral work.

4. Mortier, Julien. L'enseignement des notions fondamentales de formes géométriques (recherches expérimentales). Bruxelles, 1949. 117 p. (Cahier XI de la Revue des sciences pédagogiques).

Using original tests, the structure of which seems to have been modelled on official Belgian curricula, the author sets out to determine, on pupils in the 6th, 7th and 8th years of the primary school (12 to 14 years) the following factors regarding geometric forms: (a) the total value of what is learnt at school; (b) the understanding and application of concepts; (c) the mental faculties required for the application of knowledge.

BULGARIA

5. Ivanov, P. Metodika na obučenieto po matematika v našite sredni učilišta. Sofia, Državno izdatelstvo "Nauka i izkustvo", 1953. 431 p.

A history of the teaching of mathematics, covering the part played by mathematics in the intellectual development of secondary pupils (analysis, synthesis, induction, deduction, analogy, the determination of concepts etc.) and a critical account of teaching methods and their application to the various branches of mathematics.

DENMARK

6. Danmark. Statens paedagogiske studiesamling. Fortegnelse over litteratur vedrørende regne- og matematikundervisning. København, 1950. 16 p.

General bibliography on mathematics.

FRANCE

7. Brunold, C. Esquisse d'une pédagogie de la redécouverte dans l'enseignement scientifique. Paris, Masson, 1946. 48 p.

The author considers that science teaching at all levels has a twofold aim: to equip the adolescent with the knowledge essential for everyday and professional life, and to inculcate a mental discipline and methods that can be acquired only through practical scientific work and will remain as second nature throughout life. To solve the problems raised by these requirements, the author, now Director of Secondary Education in France, suggests an active method in the best sense of the word. He shows how both of the aims pursued with regard to adolescents may be attained by employing the "re-discovery" method. This makes it possible, even at the most elementary levels, to inculcate mental habits which will have a definite effect on the pupil's mind and character.

8. Dugas, R. Essai sur l'incompréhension mathématique. Paris, Vuibert, 1940. 136 p.

While this essay is not a book on teaching method, in the strict sense, it will be of service to teachers by drawing their attention to some of the difficulties that pupils may experience. A number of examples of famous errors are given in the annex.

9. Fouché, André. La pédagogie des mathématiques. Paris, Presses universitaires de France, 1952. 134 p. (Nouvelle Encyclopédie pédagogique).

It has now become impossible to teach mathematics without taking due account of the general structural relationship between the different concepts established by the various operations employed - a fact which applies to arithmetic, geometry and algebra alike. This gives the impression, despite certain difficulties which the author tries to explain with the help of practical examples, that mathematics teaching is characterized by strict rigidity and absolute clarity. However, the whole essense of mathematics teaching is to break down this rigidity by showing that the general structure of the subject allows of separate solutions through the application of associative, reversible and commutative laws, etc.

10. France. Direction de l'enseignement du second degré. Recrutement et formation des maîtres de l'enseignement du second degré. Paris, Service d'édition et de vente des publications de l'Education nationale, 1958. 117 p. (Nouvelle série, No. 6).

One of the most important of the many problems that have engaged the attention of the Directorate of Secondary Education in France over the past few years is the recruitment and training of teachers. The present work, published by the Directorate, describes the efforts made and the results registered since Liberation, and includes an examination of the problems relating to the recruitment and training of mathematics teachers in particular.

11. France. Ministère de l'éducation nationale. Instructions générales concernant l'enseignement des mathématiques. Paris, Centre national de Documentation pédagogique, 1953, 12 p. (Brochure No.109 D.P.).

Although the French Government allows its teachers a very free hand, it helps them by appending a detailed commentary to the syllabuses offered in the various secondary school classes. Prepared by the authorities responsible for secondary education, it more or less amounts to a short course in pedagogy, with the aims and methods of mathematics teaching studied in the light of all the experimental work done in France on the subject.

12. Honnet, J. Résolution des problèmes élémentaires de géométrie. 3e éd. Paris, Vuibert, 1935. 202 p., illus.

This work on methodology is intended for beginners who, while knowing their subject, are unable to apply it for want of sufficient practice. The author shows them what method to use for solving problems, and his book thus offers an excellent course in teaching method.

It has the great merit of splitting up geometry into its component parts. It begins by explaining the elementary properties one by one and familiarizes readers with each of them by an abundance of exercises. For each group of problems, he shows the property to be applied and thus trains readers progressively in geometrical reasoning.

The author describes eight or ten ways of proving that two segments of straight lines or of two angles are equal, or that two straight lines are perpendicular. This is no textbook, in fact, but a pedagogical work designed to teach pupils how to apply their knowledge and use it correctly in finding solutions for geometry problems.

13. Mialaret, G. Etude sur la sélection et la formation des professeurs de mathématiques. Paris, Centre national de la Recherche scientifique, 1959. 78 p.

The author's aim is to state the problem of the selection and training of teachers in as scientific a manner as possible, and his book describes experiments and operations conducted with successive generations of students in teacher-training establishments who are intending to

become mathematics teachers, and with young teachers whose careers he followed over a number of years. After making a fairly full psychological analysis and comparing the judgements of those responsible for training these young people, he pinpoints all the difficulties they experience in adapting themselves to professional life and concludes by proposing practical rules concerning the proper relationship between teacher training establishments and the inspection authorities and advancing a number of suggestions concerning the training of prospective teachers.

14. Mialaret, G. Les méthodes de rééducation en mathématiques. Paris, Bourrelier, 1959. (In the press).

After discussing the main types of difficulty encountered by adolescents taking up mathematics, the author gives specific examples of re-education to illustrate how to cope with the difficult task of setting them on the right path again during their critical period of "juvenile originality", to borrow Mr. Devesse's expression. He concludes with a tentative list of the causes of failure at mathematics and suggests educational or psychological remedies in each case.

15. _____. Recherches sur la pédagogie des mathématiques. Thèse de doctorat, June 1957. (In the press).

The author considers the problem of mathematics teaching in the light of experimental education but with a close eye to the everyday realities of school life. In the first part he analyses the experimental approach on the basis of specific examples of experiments carried out in secondary schools and in the second part he studies in broad outline the reasoning processes of the adolescent when he comes to grips with mathematics as now taught in high schools. The last part retraces the major advances in mathematics teaching and points the direction to be followed to make it more effective and prepare young people for present-day scientific studies.

16. Vuibert, H. Les anaglyphes géométriques. Paris, Vuibert, 1923, 40 p.

One of the difficulties of teaching solid geometry is that not everyone is capable of acquiring the three-dimensional vision necessary for this branch of mathematics. H. Vuibert's work shows a way of remedying this difficulty by means of a special presentation of three-dimensional shapes. Stereoscopic vision is obtained by the superimposition of two plane figures of different colours, which are viewed through glasses with different coloured lenses.

17. Zadou-Naïsky, G. Les sciences physico-mathématiques dans l'enseignement. Paris, Presses universitaires de France, 1954. 143 p. (Nouvelle Encyclopédie pédagogique).

The author lays down principles of teaching physics and mathematics in accordance with the data furnished by child psychology and on the basis of the social rôle in modern science; he then proceeds to analyse principles and present practice in the teaching of these subjects and proposes changes in secondary scientific education.

See also abstracts nos. 59, 61, 63, 64.

FEDERAL REPUBLIC OF GERMANY

18. Becker, Oskar. Grundlagen der Mathematik in geschichtlicher Entwicklung. Freiburg; München, K. Alber, 1954, 422 p.

With the help of original documents the author endeavours to trace the historical development of mathematics from the Egyptian and Babylonian antiquities up to the present time:

I. Mathematics before the Greek Civilization;
II. The Greeks' creation of mathematical sciences;
III. Constitution of modern mathematical sciences in the 17th Century;
IV. Mathematical criticism in the 19th Century;
V. Research in the 20th Century.

19. Breidenbach, Walter. Methodik des mathematischen Unterrichts. Stuttgart, Ernst Klett Verlag, 1950. 191 p.

A detailed introduction to the method of teaching mathematics to children from six to eighteen years of age. The author deems that the modern approach must be adopted from the very beginning.

20. Fettweis, Ewald. Methodik für den Rechenunterricht. Zum praktischen Gebrauch und zum Gebrauch in Vorlesungen und Übungen. 2. Auflage. Paderborn, Verlag Ferdinand Schöningh, 1949. 271 p.

In this work, which is intended for all teachers whatever training they have had, the author sets out to show that the principles of teaching in any given subject are a branch of science and not a collection of cut-and-dried recipes.

21. Lietzmann, Walther. Schulreform und mathematischer Unterricht. Heidelberg, Quelle & Meyer, 1949. 127 p.

Considerations on the very intimate connexion between the general principles of educational reform in Germany and the introduction of new methods of mathematics teaching and the corresponding syllabuses.

22. Menninger, Karl. Rechenkniffe. Lustiges und vorteilhaftes Rechnen. 8. Auflage. Stuttgart, Ernst Klett Verlag, 1950. 92 p.

The author writes for all those who wish to get on better terms with arithmetic and who still have a "dread" of numbers. He amusingly demonstrates how these fears can be overcome.

23. Strakosch, Alexander. Einführung in die Geometrie durch übende Ausschauung. I. Enthüllung der Grunderscheinungen der ebenen Geometrie aus dem regelmässigen Kreisfeld. Freiburg im Breisgau, Novalis-Verlag, n.d. 36 p.

A detailed study, based on indications given in the educational work of Rudolf Steiner, of a method of teaching geometry in the light of the principle of pupil-activity.

INDIA

24. Report of the seminar on the teaching of mathematics in secondary schools. New Delhi, All-India Council for Secondary Education, 1958. 92 p.

This account of the work of the seminar on mathematics teaching covers all aspects of the subject at all levels. The following questions concerning secondary teaching are dealt with: syllabuses, methods, assessment of results, works to be made available to pupils, additional recreational activities and teacher training.

IRELAND

25. Ireland. Department of Education. Notes for teachers; mathematics. Dublin, Stationery Office, 1952. 24 p.

Practical guidance for teachers; discussions of teaching method with reference to specific examples.

ITALY

26. Campedelli, Luigi. Commento ai programmi di matematica. Milano, Marzorati, 1955. 121 p.

Comments on the mathematics tests that ought to be given to candidates for secondary teaching. The chief items which are frequently to be found in these tests are brought out and analysed so as to avoid mere memorization. The student in mathematics should be put on his guard against the danger of debasing a science to the level of a technical mechanism by letting anxiety to satisfy an examination board take precedence over the desire for personal discovery and research.

MEXICO

27. Tirado Benedí, Domingo. La aritmética. México, Luis Fernandez, 1953. 116 p. (Ensayos pedagógicos, III).

A concise treatise on arithmetic teaching methods, written by a professor of the national teacher training school, dealing with the aims of arithmetic teaching, introduction to the technique of calculation and measurement, special arithmetic procedures, teaching material, and control of school output with regard to the teaching of this subject.

NETHERLANDS

28. Bunt, L.N.H. The teaching of mathematics to students between 16 and 21 years of age in the Netherlands. A report to the international commission on mathematical instruction. Groningen, J.B. Wolters, 1955. 98 p.

This work actually amounts to a report on present-day mathematics teaching in the Netherlands. In his preface the author explains how he was hampered by the age-limits imposed on him, but he covers all educational establishments, giving details, for each, of the type of mathematical studies and syllabuses, the number of lessons a week, the results obtained, the textbooks used and the examinations set. The annex contains specimen examination papers for the various Netherlands universities and high schools.

NEW ZEALAND

29. Murdoch, J.H. The teaching of mathematics in post-primary schools. Wellington, New Zealand Council for Educational Research, 1950. 184 p. bibl. (Studies in Education no. 12).

Dealing with one of the "core" subjects of the revised curricula embodying new educational aims and ideas in New Zealand, this volume "seeks to explain the new conception of secondary school mathematics and to point out the changes in form and method of presentation rendered necessary by the new outlook". The author devotes most space to a consideration of general attitudes and principles rather than to teaching methods. The fact that less time than previously is now spent on mathematics in post-primary schools makes the right presentation of the subject more important and emphasizes the need for a more efficient training of future teachers of mathematics,

especially of those who, without themselves having any pronounced mathematical ability, are yet called upon to teach this difficult subject, at least in the junior forms.

POLAND

30. Fessel, Abraham. Kształtowanie podstaw naukowego pogladu na swiat w procesie nauczania matematyki. Warszawa, Państwowe Zakłady Wydawnictw Szkolnych, 1957. 216 p.

Influence of mathematical study on the development of general ideas and on the manner of conceiving the world (functions; non-Euclidean geometry; logic; isomorphism; dialectic reasoning). The author illustrates his theories with many examples borrowed from arithmetic, algebra, geometry and trigonometry.

31. Kartasiński, Stanislaw. Nauczanie trygonometrii w szkole ogólnokształcącej. Warszawa, Panstwowe Zakłady Wydawnictw Szkolnych, 1953. 224 p.

This work, prepared for secondary schools by the Warsaw Pedagogical Institute, contains instructions and detailed syllabuses for the teaching of trigonometry. The introductory chapter surveys the history of the subject.

32. Straszewicza, S., ed. Nauczanie geometrii w klasach licealnych szkoły ogólnokształcącej. Warszawa, Państwowe Zakłady Wydawnictw Szkolnych, 1954, 531 p.

This work deals with geometry teaching in general secondary schools and is in four parts, the first of which describes the methods used.

SPAIN

33. Puig Adam, P. Didáctica matemática eurística. Madrid, Instituto de formación del profesorado de enseñanza laboral, 1956. 136 p.

In this work the author, who occupies the chair of methodology at the Madrid University's faculty of science, takes as basis the heuristic method and proceeds to evolve the schema of twenty lessons in arithmetic, algebra and geometry, in accordance with tests relative to mathematics teaching, organized under his direction at one of Madrid's secondary schools. One chapter is devoted to the question of employing local subject matter for mathematics teaching.

SWEDEN

34. Wigforss, Frits. Den grundläggande matematikundervisningen. Översikt av folkskolans kurs i matematik enligt 1954 års undervisningsplan ur metodisk synpunkt. 5 uppl. Stockholm, Bergvalls Förlag, 1954. 187 p.

Mathematical directions dealing with the mathematics syllabus in the seven-year primary school in Sweden.

SWITZERLAND

35. Aebli, Hans. Didactique psychologique. Application à la didactique de la psychologie de J. Piaget. Neuchâtel; Paris, Delachaux et Niestlé, 1952. 172 p. (Actualités pédagogiques et psychologiques).

The author analyses J. Piaget's writings and sees how far his psychological findings can provide guidance for the teacher. The psychological analysis is penetrating, and the avenues disclosed in the field of teaching method are highly promising.

36. Johannot, L. Le raisonnement mathématique de l'adolescent. Neuchâtel; Paris, Delachaux et Niestlé, 1947. 174 p. (Actualités pédagogiques et psychologiques).

This study, also inspired by the work of J. Piaget, covers fairly new ground. The workings of the child's and the adult's mind have already been the subject of extensive research, but the adolescent's mind has not received the same attention. Mr. Johannot has selected one of the most suitable aspects for research. Study of the development of mathematical reasoning means grappling with the problem of the transition from concrete to abstract thinking - that is, from intuition to genuine reflection. Using the clinical method, the author singles out a number of landmarks in this process, and teachers will find valuable food for thought in this work as well as most useful practical guidance.

37. Le matériel pour l'enseignement des mathématiques. Neuchâtel; Paris, Delachaux et Niestlé, 1958. 211 p.

Mathematics teaching no longer confines itself today to pure abstraction, so alien to the child's way of thinking: it aims at increased effectiveness, rather, and regards the use of equipment not as a debasement of mathematical standards but as an effort to unlock the secrets of the mathematical world for all. What the authors are interested in are not the practical methods that should be used by teachers in the classroom but the major educational problems connected with equipment as such.

This venture on the part of leading mathematics teachers seeking to develop logical habits of thought and of psycho-philosophers marks a turning point in the history of mathematics teaching and opens up new prospects for the training of the mathematicians of the future.

38. Muller, Lydia. Recherches sur la compréhension des règles algébriques chez l'enfant. Thèse de doctorat. Neuchâtel; Paris, Delachaux et Niestlé, 1956. 242 p.

An experimental analysis, based on the method of interrogation, concerning the child's understanding of the rule of signs. As a result of this study it is possible to follow the progress of the notion in the child's mind, demonstrate the rôle of practice and provide matter for the working out of a mathematics teaching programme; simple exercises, actual games involving the rule of signs, assist the child, in the author's view, to grasp the first algebraical notions and even to continue with the study of mathematics.

39. Nicolet, J.L. Initiations mathématiques et dessins animés. Lausanne, Payot, 1942. 30 p.

Study of the part played by cartoons in the transition from initiation to logical thought.

40. Piaget, J. Introduction à l'épistémologie génétique. Paris, Presses universitaires de France, 1950. 2 vol. (Bibliothèque de philosophie contemporaine).

While the two important works making up this masterly introduction to genetic epistemology are not treatises on teaching method for mathematics in the strict sense, the ground they cover adds vastly to our understanding of the development of mathematical thought and they thus help us to get a better view of present-day concepts in their historical and philosophical setting. The first volume, dealing with mathematical thought (the second is concerned with physical thought) discusses the way in which the concepts of numbers and space have been shaped over the course of time and through various philosophical systems, and concludes with a study of the relationship between mathematical knowledge and reality. It is in the chapters bearing on the growth of the concept of numbers that the author develops his seminal theories on abstract thought; and teachers would do well to ponder these pages which contain, in embryo, the major elements of the main solutions to the problems involved in mathematics teaching.

41. _____. Beth, E.W., et al. L'enseignement des mathématiques. Neuchâtel; Paris, Delachaux et Niestlé, 1955, 175 p. (Actualités pédagogiques et psychologiques).

Collective publication of the International Commission for the Study and Improvement of the Teaching of Mathematics, in which a psychologist, a logician-mathematician, three professional mathematicians and a teacher of mathematics took part.

I. Mathematical structures and the operative structures of intelligence, by J. Piaget;
II. Reflection on the organization and the method of mathematical teaching, by E.W. Beth;
III. Abstraction in mathematics and the evolution of algebra, by J. Dieudonné;
IV. Introduction of the spirit of modern algebra in elementary algebra and geometry, by A. Lichnerowicz;
V. On the teaching of elementary geometry, by G. Choquet;
VI. The pedagogy of mathematics, by C. Gattegno.

42. Piaget, J. Inhelder, B. De la logique de l'enfant á la logique de l'adolescent. Paris, Presses universitaires de France, 1955. 314 p. (Bibliothéque de philosophie contemporaine).

Although much has been written about the emotional and social development of the adolescent, there are few full-scale studies of the problem of reasoning. This book thus fills a definite gap. The authors use most ingenious laboratory material to work out the stages through which adolescents pass before reaching the level of "formal" thought; those of imaginative techniques, concrete techniques and scientific techniques. "Formal" thought is the hallmark of the adolescent's thinking, and its first signs are detectable at the pre-adolescent stage (12 to 14 years of age), the final stage being completed at the age of 15. Of course, not all adolescent thinking is reduced to "formal" thought; the latter is characteristic only of the peak intellectual performances of the young people concerned, who continue to solve problems by concrete operations. In addition they possess practical mental abilities which follow a relatively independent course of development from early childhood onwards, and which still colour many of their activity patterns. But "formal" thought opens up a very wide range of possibilities and enables adolescents to assimilate the concepts which form the logical basis of mathematical structure.

43. _____. _____. Le développement des quantités chez l'enfant. Conservation et atomisme. Neuchâtel; Paris, Delachaux et Niestlé, 1941. 344 p. (Actualités pédagogiques).

This book is a sequel to the foregoing but covers a wider field. The authors set out to analyse how the child, once he has mastered the elementary concepts of logical and numerical quantity, applies them in a general way to the main material data

accessible to him, such as material quantity, weight and physical volume. In the course of this research, the authors bring out the basic concept of conservation, which is undoubtedly one of the most important and fruitful ideas of modern genetic psychology. In conclusion, they compare the development of child thought with that of the progressive "decentration" action proper and thus clear the way for all possible studies of intellectual development viewed from this functional and genetic angle.

44. Piaget, J. Inhelder, B. La représentation de l'espace chez l'enfant. Paris, Presses universitaires de France, 1948. 581 p. (Bibliothèque de philosophie contemporaine. Psychologie et sociologie).

Philosophers and psychologists have been discussing the nature of space for centuries. The authors, in venturing a solution of this age-old problem, choose the experimental method, since it seems that only genetic findings can give us an insight into the real factors involved in the visualization of space. Practically all of the elementary handbooks on geometry represent the initial concepts of space as being based on Euclidean intuition. The authors, on the other hand, find that the child's essential concept of space is active and operative, beginning with elementary topological intuition long before it acquires a projective, Euclidean character. They demonstrate, therefore, that the teaching of elementary geometry would need to be adapted to this spontaneous evolution of concepts, which is far more in line with mathematical construction itself than most of the so-called "elementary" textbooks.

45. _____. _____. Szeminska. A. La géométrie spontanée de l'enfant. Paris, Presses universitaires de France, 1948. 514 p. (Bibliothèque de philosophie contemporaine. Psychologie et sociologie).

In this work the authors study the psychological bases of geometry as taught in primary schools; and although it does not purport to discuss teaching method, it brings out the main stages in the psychogenesis of metric concepts in children and is thus an essential aid for all teachers concerned with the early stages of mathematics teaching. In the course of their research, the authors rediscover evolutionary laws paralleling those of the concept of numbers: hence the psychological value of their analyses. The first part of the book discusses spontaneous reactions in respect of measurement and the representation of movement, while the second part deals with conservation and the measurement of length. The metric construction of angles and curves is studied in the third part; the fourth deals with plane and solid geometry; and the book ends with a general survey of the main stages in the formation of metric space.

46. Piaget, J. Szeminska, A. La genèse du nombre chez l'enfant. Neuchâtel; Paris, Delachaux et Niestlé, 1941. 308 p. (Actualités pédagogiques).

Professor Piaget's study of the child's first grasp of numbers marked a new phase in his psychological studies. As he himself put it: "for new problems, there must be corresponding methods". And while the authors still keep to the method of free conversation with children, this work represents a new departure in manipulative treatment by means of suitable laboratory material whose planning reveals real experimental mastery, as when the authors demonstrate, on the basis of highly ingenious experiments, how the concept of numbers is built up in children. Their initial assumption is that this process is correlated with the development of logic itself, and that the pre-logic stage is also a pre-numerical period. Their analyses indicate that logical and arithmetical operations form a single unified and psychologically natural system, the latter being the result of the general application and combination of the former in their two complementary aspects of the inclusion of classes and the seriation of relations with the elimination of quality.

UNION OF SOVIET SOCIALIST REPUBLICS

47. Bradis, V.M. Metodika prepodavanija matematiki v srednej škole. Moskva, Gosudarstvennoe Učebno-pedagogičeskoe Izdatel'stvo Ministerstva prosveščenija RSFSR, 1954. 504 p.

A handbook on the teaching of mathematics in secondary schools, covering methods, syllabuses, textbooks and practical applications.

48. Četveruhin, N.F. Izobraženie figur v kurse geometrii. Posobie dlja učitelej i studentov pedagogičeskih institutov. Moskva, Učpedgiz, 1958. 216 p. illus.

Detailed theoretical study of the problem of the representation of geometric figures in plane projection. The concept of "integral representation" introduced by the author is basic for the theory of geometry teaching.

All in all, this monograph may be regarded as a key reference work in the field under consideration and recommended in consequence to mathematics teachers and students in senior teacher-training colleges.

49. Dorf, P.I. Nagljadnye posobija po matematike i metodika ih primenenija. Moskva, Gosudarstvennoe Učebno-pedagogičeskoe Izdatel'stvo Ministerstva prosveščenija RSFSR, 1955. 160 p.

A study of the materials used for the teaching of mathematics in secondary schools (models, charts, diagrams etc.), with comments on sense-perceptive and intuitive comprehension.

50. Gel'fand, M.S. Prepodavanie algebry v vos'mom klasse školy rabočej molodeži. Moskva, Akademija pedagogičeskih nauk RSFSR, 1957. 132 p. illus.

M.S. Gel'fand's book is intended for mathematics teachers in schools for young workers, and contains a detailed analysis of the eighth-year algebra course, to which 72 hours are devoted. The following questions are dealt with:
Revision of the sixth and seventh year programmes;
Extraction of square roots. Concept of real numbers (non-imaginary);
Second-degree equations with numerical coefficients;
Powers and roots;
Second-degree equations and equations reduced to the second degree;
Functions and graphs;
Systems of second-degree equations.
The author opens each chapter with a few notes on method, such as the most rational order to be followed for studying the question, the explanation of certain theoretical principles, the commonest mistakes made by pupils etc., and goes on to suggest how the subject matter should be divided up according to lessons, gives guidance on the method to be followed in each lesson, proposes model problems and exercises (with answers) and suggests suitable forms of homework and useful school exercises for the young workers in question.

51. Izvestija Akademii pedagogičeskih nauk. Vypusk 92. Voprosy obščej metodiki matematiki. Moskva, Akademija pedagogičeskih nauk RSFSR, 1958. 256 p. illus.

The Bulletin of the Academy of Educational Sciences contains the following articles, as summarized below:

Alexandrov, P.S. Matematika kak nauka (Mathematics as a science), pp. 5-36. Survey of the historical development of mathematics and assessment of the present status of that science. The author emphasizes the part played by Russian and Soviet scientists in the development of mathematics.

Gončarov, V.L. Matematika kak učebnyj predmet (Mathematics as an academic subject), pp. 37-66. This article contains a very interesting and searching analysis of past and present theories concerning mathematics teaching methods, and gives a clear definition of the aims of the various branches of mathematics taught at school and the main methods of attaining them.

Fetisov, A.I. Formirovanie matematičeskih ponjatij (The formation of mathematical concepts), pp. 67-94. In the light of psychological data and experience concerning the working of the higher nerve centres the author indicates the line to be followed to ensure that pupils master the fundamental concepts of mathematics.

Gibš, I.A., Principy, formy i metody obučenija matematiki (Principles, forms and methods of mathematics teaching), pp. 95-148. This article discusses the aim and content of the methodological science of mathematics teaching. The author describes the basic principles of mathematics teaching and gives many examples of their application in practice.

Fetisov, A.I., Elementy logiki v prepodavanii matematiki (Logical elements in the teaching of mathematics), pp. 149-198. This article gives a detailed description of the practical application of the laws of logic in presenting the various sections of the mathematics programme. The author devotes special attention to mathematical problems of a logical nature: necessary and sufficient conditions, axioms, isomorphism, etc.

Ševčenko, I.N., Elementy istorizma v prepodavanii matematiki (Historical elements in the teaching of mathematics), pp. 199-229. The article discusses the place of history in the teaching of mathematics and gives example of the use of historical events in that teaching. A list of works on the history of mathematics is included.

Fetisov, A.I., Vneklassnye zanjatija po matematike v škole (Out-of-class work in mathematics), pp. 231-235. This article discusses the object and rôle of academic studies outside the classroom, examines various types of such studies and gives hints regarding their organization and the choice of subjects. A list of works on out-of-class work is included.

52. Menščenskaja, N.A. et Zykova, V.I. Puti povyščenija uspevaimosti po matematikie. Moskva, Izdatel'stvo Akademii pedagogičeskih nauk, 1955. 167 p.

Collection of articles showing suitable methods of encouraging progress in mathematics; rôle of speech in solving problems; analytic-synthetic method; invention of problems by the pupils themselves; analysis of data etc.

53. Polytehničeskoe obučenie v prepodavanii matematiki. Iz opyta raboty v V-X klassah. Moskva, Akademija pedagogičeskih nauk RSFSR, 1956. 228 p. illus.

This compendium contains an editorial describing the aims of mathematics courses in polytechnical education and the following eight articles:

Šor, Ja. A. Predvaritel'naja ocenka rezul'tatov pri rešenii zadač i primerov (Preliminary evaluation of results in the solution of problems and in exercises).

Byčkov, B.P. Funkcional'naja propedevtika v kurse algebry VI-VII klassov (Introduction to functions in Class VI and VII Algebra).

Aškinuze, V.G. Izučenie funkcij i ih grafikov v kurse algebry VIII klassah (Functions and their

graphical representation in Class VIII Algebra).

Nikol'skij, L.P., Praktičeskie raboty na urokah matematiki v V-VI klassah (Practical work in Class V-VI Mathematics).

Gel'fan, E.M., Nastol'ny poligon (The subtended base polygon).

Maslova, G.G., K voprosu o rešenii zadač na postroenie planimetrii (The solution of problems of construction in plane geometry).

Reinhard, I.A., Prikladnyje zadači v kurse geometrii (Practical problems in the Geometry course).

Pankratov, A.A., O svjazi v prepodavanii geometrii i čerčenija v srednej škole (Correlated instruction in geometry and mechanical drawing in secondary schools).

Appendix: Goniometric scale.

The compendium is a composite survey of the basic questions of polytechnical education - adaptation of mathematics teaching to production needs; characteristics of the mathematical expression of natural laws or production principles; acquisition of the ability to present concrete problems in mathematical form; and acquisition of practical knowledge useful for production.

54. Prepodavanie matematiki. Sbornik statej. Moskva, Akademija pedagogičeskih nauk RSFSR, 1957. 251 p. illus.

This publication comprises the following articles:

Fetisov, A.I., Prepodavanie matematiki v škole i politehničeskoe obučenie (Mathematics teaching in schools and polytechnical education), pp.5-6.

Ševčenko, I.N., Arifmetika (Arithmetic), pp.7-57. This article deals with the following questions: acquisition of calculation mechanisms, working of approximate values, calculation of percentages, measurement of quantities. Considerable attention is devoted to the choice of problems and to approximate calculations.

Gončarov, V.L., and Gibš, I.A., Algebra, pp.52-110. This article concentrates on developing in pupils the concept of function on training in graphical presentation and on the solution of problems consisting in the determination of maximum and minimum values of functions. It gives copious examples of theoretical and practical problems.

Fetisov, A.I., Geometrija (Geometry), pp.111-153. This article deals with the question of polytechnical teaching as part of the geometry programme. Great emphasis is laid on the inculcation of basic geometrical concepts at the earliest stages of the pupils' development. The author goes on to a detailed analysis of the rôle of plane and solid geometry, with numerous examples to illustrate the practical application of geometry to human activities.

Mihailov G.M., Elementy politehničeskogo obučenija v prepodavanii geometrii i trigonometrii v VIII-X klassah srednej školy (Polytechnical elements in Class VIII-X Geometry and Trigonometry teaching in classes VIII-X in secondary schools), pp.154-191. (This article includes a detailed description of the various types of apparatus and instruments which can be used for teaching geometry and trigonometry. The author gives hints on the construction of some of this material.

Iz opyta raspredelenija izmeritel'nyh rabot na mestnosti (Digest of experience in the allocation of mensuration work in the field), pp.192-202.

Lobanov, N.N. (classes I-IV) Lejvikov, M.L. (classes V-X) Gibš, I.A. and Milovidov, P.A. Trigonometrija (Trigonometry), pp.203-250. Many problems discussed in this article relate to the applications of trigonometry to the solution of practical problems. Considerable attention is also given to problems relating to harmonic oscillations.

55. Pčelko, A.S. ed. Opyt prepodavanija arifmetiki v načalnoe škole. Moskva, Izdatel'stvo Akademii pedagogičeskih nauk RSFSR, 1953. 92 p.

A handbook on the teaching of arithmetic at primary level, covering the following: the use of the pupils' surroundings, including the streets and the school playground (measures of length and capacity); common objects (addition and subtraction); bread (fractions); working models (problems on movement); dramatization, etc.

56. Semušin, A.D. Metodika obučenija rešeniju zadač na postroenie. Moskva, Akademija pedagogičeskih nauk RSFSR, 1959. 159 p. illus.

This book deals with the methods for solving stereometric problems in the geometry syllabus. This question is of great importance at the present stage of development of Soviet education, being closely bound up with the general question of polytechnical instruction. The author discusses in detail in the light of his own experience and that of J. Adamar and N.F. Četveruhin, the methods applied for solving problems relating to figures shown in projection.

The work is intended for mathematics teachers and instructors and students at senior teacher training schools.

57. Stratilatov, P.V. ed. Iz opyta prepodavanija matematiki. Moskva, Gosudarstvennoe učebno-pedagogičeskoe izdatel'stvo Ministerstva prosvščenija RSFSR, 1954. 290 p.

Sixteen articles on method concerning the teaching of arithmetic, algebra, geometry and the elements of land measurement in Vth, VIth and VIIth grades of secondary schools.

58. Stratilatov, P.V. ed. Iz opyta prepodavanija matematiki. Moskva, Gosudarstvennoe učebno-pedagogičeskoe izdatel'stvo Ministerstva prosveščenija RSFSR, 1955. 351 p.

How to teach algebra, geometry, and trigonometry in the VIIIth, IXth and Xth classes of the ten-year school; general procedures for the teaching of mathematics. Teachers' experiences, questions of methodology, problems concerning the application of mathematics in polytechnical education. Raising the standard of accuracy of expression through mathematics; pupils' circles and societies; mathematics as a vital science portraying life.

59. _____. Iz opyta prepodavanija matematiki v VII-X klassah srednej školy. Moskva, Gosudarstvennoe učebno-pedagičeskoe izdatel'stvo Ministerstva prosveščenija RSFSR, 1955. 350 p.

Results of experiments in the teaching of mathematics to the VIII-Xth classes of secondary schools (algebra, geometry, theory of mathematics teaching). Methods, history of mathematics teaching, practical applications.

60. Zykova, V.I. Očerki psikologii usvoenija načalnyk geometričeskih znanii. Moskva, Gosudarstvennoe učebno-pedagogičeskoe izdatelstvo Ministerstva prosveščenija RSFSR, 1955. 164 p.

A handbook comprising an analysis of the peculiarities of assimilation of elementary knowledge in geometry and an examination of the mental process involved in the solution of problems and the demonstration of theorems.

UNITED KINGDOM

61. Beet, Ernest Agar. Teaching astronomy in schools. Cambridge, The University Press, 1956. XI, 72 p.

This manual is based on lectures given to members of the teaching profession and the ensuing discussions. It outlines syllabuses of astronomy lessons for children aged 11 to 14 and examines the problems involved in instruction in this subject and of practical work in school and outdoors. A chapter is included on the school telescope and observatory, as outstanding teaching aids, and another on such aids as maps, projections and filmstrips.

62. Brookes, B.C. Notes on the teaching of statistics in schools. London, Heinemann, 1952. 80 p.

The Teaching Committee of the Royal Statistical Society has issued a report giving arguments in favour of the teaching of statistics in schools, and the subject is an optional one in the curricula drawn up by the General Certificate of Education authorities. The author of these notes offers practical advice and suggestions on the matter to teachers at all levels in all types of secondary school. The first section discusses the co-ordination of mathematics with other subjects in the general curriculum, and the second contains comments on the GCE curriculum for pupils in the higher forms.

63. Great Britain. Scottish Education Department. Mathematics in secondary schools. Edinburgh, H.M.S.O., 1950. 28 p.

Detailed particulars concerning the three years of mathematics required for the Scottish Leaving Certificate.

64. Incorporated Association of Assistant Masters in Secondary Schools. The teaching of mathematics. Cambridge, The University Press, 1957. 231 p.

Report on mathematics teaching in English secondary schools, taking into account some of the changes which have affected the teaching of mathematics in secondary grammar schools since the issue of the 1919 report, and the changing attitude to mathematics. Examination of the aims, methods and syllabuses, the teaching of mathematics at pre-secondary level, etc. The report contains numerous suggestions and stresses the teacher's rôle in engendering in the pupil a love of mathematics.

65. Mathematical Association. The teaching of algebra in sixth forms. London, G. Bell & Sons, 1958. 104 p.

Report on the teaching of algebra in England, dealing with the syllabus for sixth forms; elementary topics, proofs, complex numbers, linear equations and determinants, polynomials and partial fractions, symmetric functions and the theory of equations, finite series and difference equations, theory of numbers, inequalities.

66. Sumner, W.L. Statistics in school. 2nd ed. Oxford, Blackwell, 1950. 183 p. bibl.

First written in 1948, this introduction to the study of statistical methods in school is intended for those who are not yet very familiar with the subject. A second edition has now been published, with more space able to be devoted to sampling techniques, statistics etc. Teachers and research workers will find it a useful guide for the solution of practical problems relating to intelligence, observation and testing.

UNITED STATES OF AMERICA

67. Adler, J. The new mathematics. New York, John Day, 1958. 187 p., illus.

Such great changes have occurred in the content and methods of mathematics during the past century that only advanced students have been able to get on familiar terms with them. They are explained here for the first time in a work accessible to all those with a taste for algebra and plane geometry.

68. Brown, Kenneth E. Analysis of research in the teaching of mathematics, 1955 and 1956. Washington, D.C., U.S. Office of Education, 1958. 73 p. (U.S. Office of Education Bulletin 1958, No. 4).

It is very useful to be regularly informed about the state of scientific research on mathematics teaching. This little book sums up the position in 1955 and 1956. It divides research into three categories of work relating, respectively, to secondary schools, schools providing advanced education in mathematics, and primary schools. A list of outstanding questions is included.

69. _____. Mathematics in public high schools. Washington, D.C., U.S. Office of Education, 1953, 47 p. (U.S. Office of Education Bulletin, No. 5).

A study on the teaching of mathematics in the public high schools of the United States of America, based on information received from 857 such schools and containing statistical data concerning curricula, examinations, frequency of lessons, status of teachers, etc.

70. Butler, Charles H.; Wren, F. Lynwood. The teaching of secondary mathematics. New York, McGraw-Hill, 1951. 550 p. (McGraw-Hill series in education).

I. The place and function of mathematics in secondary education; general orientation, informational and philosophical background.

II. The improvement and evaluation of instruction in secondary mathematics; materials and means to effective instruction; stimulating and maintaining the pupils' interest; preparation of teachers; etc.

III. The teaching of the special subject matter of secondary mathematics (arithmetic, algebra, geometry, trigonometry and logarithms, calculus).

71. Education for the talented in mathematics and science. A report of a joint Conference of the Co-operative Committee on the Teaching of Science and the United States Office of Education. Washington, D.C., U.S. Office of Education, 1952. 34 p. (U.S. Office of Education Bulletin 1952, No. 15).

A brief survey of methods of identifying talents in mathematics and science, and suggestions concerning the teaching of mathematics and science to talented students.

72. Fehr, H.F. Secondary mathematics: a functional approach for teachers. Boston, D.C. Heath, 1951. 431 p. illus.

This book for teachers is not, strictly speaking, a pedagogic work, for without developing any theory it gives a pedagogic presentation of the mathematical concepts to be taught to adolescents. Each section of the study programme is given a functional perspective and commentated so as to enable teachers to use it to best advantage. At the end of each chapter are references for the questions studied.

73. Leonhardy, Adèle. Introductory college mathematics. New York, Wiley; London, Chapman & Hall, 1952. 450 p.

Believing that every well-educated person ought to realize the importance of mathematics as a tool not only for technological advance but also for the expansion of the frontier of knowledge, the author has planned this introduction to general mathematics to meet the needs, in particular, of those college students who do not intend to specialize in mathematics.

74. Mathematics for all high school youth. Report of basic skills Conference - Clinics in Mathematics. Albany, N.Y., State Education Department, Bureau of Secondary Curriculum Development, 1953. 108 p., bibl.

The report includes contributions by teachers representing the United States public in general and specialists in mathematics teaching in particular. The various aspects of the teaching of this discipline are closely reviewed, with the accent on the psychological aspects. An interesting bibliography is included.

75. National Council of Teachers of Mathematics. Emerging practices in mathematics education. Washington, D.C., 1954. 434 p., illus., bibl.

This highly interesting work describes current and experimental classroom methods from the elementary to the secondary education stage. The second section, on practical work in mathematics teaching, contains very useful points about the use of radio, television and films for initiation into abstract disciplines. The question of modern mathematics and its inclusion in educational programmes is raised in the fourth section, and the book concludes with a study of means of appraisal. There is an extensive annotated bibliography.

76. National Society for the Study of Education. Committee on the Teaching of Arithmetic. The teaching of arithmetic. Edited by Nelson B. Henry. Chicago, The University of Chicago Press, 1951. 303 p. (50th yearbook).

This volume deals with arithmetic teaching at all educational levels from pre-school instruction to secondary school. It is a veritable treatise on the psychopedagogy of arithmetic; with the psychological and pedagogic aspects sustaining each other and jointly contributing to methodological progress. The book ends with an examination of the fields still to be explored by scientific research. There are bibliographical references at the end of each chapter.

77. Polya, G. How to solve it; a new aspect of mathematical method. New York, Doubleday, 1957. 253 p., illus.

An eminent United States mathematician has set himself the task, in this simple and original book, of stimulating the mathematical talent of his readers. It presents a summary, as it were, of known systems for solving all kinds of problems from which the author derives a novel teaching method which can be applied with ease.

With ease, indeed, for the reader gets his bearings on the subject from the start. And novel, too: all it calls for is common sense.

The points made are developed from the two tables of questions and suggestions placed at the beginning and end of the volume, so that the reader can easily put his finger on them. A concise "heuristic dictionary", which is easily the most important part of the work, reviews, defines and illustrates the tables relating to the method.

The author, who is writing for a broad, educated public, succeeds in pleasantly arousing the reader's curiosity and convincing him that he can take up mathematics in a relaxed and lucid frame of mind.

78. Spitzer, Herbert F. Practical classroom procedures for enriching arithmetic. St. Louis, Mo. Webster Publishing Co., 1956. 224 p.

This book contains over two hundred suggestions for making arithmetic lessons more attractive while enabling pupils to undertake some of the experiments which are the basis for certain aspects of modern mathematics. The problems should also be useful in the preparation of special study programmes for particularly gifted pupils.

79. Wheat, Harry Grove. How to teach arithmetic. Evanston, Ill.; White Plains, N.Y., Row, Peterson & Co., 1956. 438 p.

A guide for teachers and prospective teachers on the procedures involved in teaching arithmetic so as to stimulate and direct the learning activities of pupils. The first eight chapters correspond to the work to be taught in the first eight years at school, while later chapters present the general methods of teaching pupils to reason and to work out problems and show how the teacher can improve his own number work. Included also is the story of measures and weights.

UNESCO COUPONS

We should like to draw the attention of our readers to the Unesco Coupon Scheme, which may enable them to purchase materials listed in this periodical. Because it is often difficult to send money from country to country for the purchase of books, films, laboratory equipment, etc., Unesco has created a sort of international currency, the UNESCO COUPON. *These coupons enable schools, universities, teachers and students in many parts of the world to buy freely the materials which they need for study and research.*

UNESCO COUPONS *can be used to buy:*

books

periodicals

photocopies

microfilm copies

art reproductions

charts, globes, maps, sheet music

gramophone records

the following categories of educational films:

(a) screening prints and duplicate prints

(b) original negatives and duplicate negatives

as well as

(c) 16mm. raw film for printing the above categories of films

various categories of scientific material for education and research, such as:

optical instruments, balances and weights

laboratory glass-ware

electrical measuring instruments

analytical and clinical testing apparatus, etc.

UNESCO COUPONS *are on sale in most Member States which have currency restrictions. If you do not know where to obtain coupons, please consult your National Commission for Unesco or write to Unesco, Paris, for the information.*

The TRAVEL COUPON SCHEME, *which is designed to overcome the currency barriers to educational and cultural travel, is an extension of the Unesco Coupon Scheme described above. Travel Coupons are a form of international travellers'cheque. They provide the foreign exchange needed to enable travellers such as students, teachers and research workers to spend time abroad for study or research.*

For full details, please refer to the following explanatory leaflets:

UNESCO COUPONS

with separate addenda on

BOOK COUPONS

FILM COUPONS

COUPONS FOR SCIENTIFIC MATERIAL

INTRODUCING THE UNESCO TRAVEL COUPON

(containing the addresses of the national agencies responsible for the allocation and issue of coupons, and the banks where they may be cashed)

which may be obtained upon request from the:

UNESCO COUPON OFFICE

Place de Fontenoy,

Paris - 7e (France)

UNESCO PUBLICATIONS: NATIONAL DISTRIBUTORS

Afghanistan: Panuzai, Press Department, Royal Afghan Ministry of Education, KABUL.
Albania: Ndermarrja Shteterore e Botimeve, "Naim Frasheri", TIRANA.
Algeria: Editions de l'Empire, 28, rue Michelet, ALGER.
Argentina: Editorial Sudamericana S.A., Alsina 500, BUENOS AIRES.
Australia: Melbourne University Press, 369 Lonsdale Street, MELBOURNE C.1 (Victoria).
Austria: Verlag Georg Fromme & Co., Spengergasse 39, WIEN V.
Belgium: Office de publicité S.A., 16, rue Marcq, BRUXELLES; N.V. Standaard Boekhandel, Belgiëlei 151, ANTWERPEN. For *The Courier:* Louis de Lannoy, 22 Place de Brouckère, BRUXELLES.
Bolivia: Librería Selecciones, avenida Camacho 369, casilla 972, LA PAZ.
Brazil: Fundação Getúlio Vargas, 186 Praia de Botafogo, caixa postal 4081, RIO DE JANEIRO.
Bulgaria: Raznoïznos, 1, Tzar Assen, SOFIA.
Burma: S.P.C.K. (Burma), 549 Merchant Street, P.O. Box 222, RANGOON.
Cambodia: Librairie Albert Portail, 14, avenue Boulloche, PHNOM-PENH.
Canada: The Queen's Printer, OTTAWA (Ont.)
Ceylon: Lake House Bookshop, P.O. Box 244, Lady Lochore Building, 100 Parsons Road, COLOMBO 2.
Chile: Editorial Universitaria S.A., avenida B. O'Higgins 1058, casilla 10220, SANTIAGO.
China: The World Book Co., Ltd., 99 Chungking South Road, Section 1, TAIPEH, Taiwan (Formosa).
Colombia: Librería Central Carrera 6-A n.º 14-32, BOGOTA.
Costa Rica: Imprenta y Librería Trejos, S.A., apartado 1313, SAN JOSE.
Cuba: Librería Económica, Pte. Zayas 505-7, apartado 113, LA HABANA.
Czechoslovakia: Artia Ltd., 30, Ve Smečkách, PRAHA 2.
Denmark: Ejnar Munksgaard Ltd., 6 Nørregade, KOBENHAVN K.
Dominican Republic: Librería Dominicana, Mercedes 49, apartado de correos 656, CIUDAD TRUJILLO.
Ecuador: Casa de la Cultura Ecuatoriana, Núcleo del Guayas, Pedro Moncayo y 9 de Octubre, casilla de correo n.º 3542, GUAYAQUIL.
El Salvador: Manuel Navas & Cia., 1.ª avenida Sur 37, SAN SALVADOR.
Ethiopia: International Press Agency, P.O. Box 120, ADDIS ABABA
Finland: Akateeminen Kirjakauppa, 2 Keskuskatu, HELSINKI,
France: Librairie de l'Unesco, place de Fontenoy, PARIS-7e; *Wholesale:* Sales Section, place de Fontenoy, PARIS-7e.
French West Indies: Librairie J. Bocage, 15, rue Ledru-Rollin, B.P. 208, FORT-DE-FRANCE (Martinique).
Germany (Fed. Rep.): R. Oldenbourg K.G., Unesco-Vertrieb für Deutschland, Rosenheimerstrasse 145, MUNCHEN 8.
Greece: Librairie H. Kauffman, 28, rue du Stade, ATHENES.
Haiti: Librairie "A la Caravelle", 36, rue Roux, B.P. 111, PORT-AU-PRINCE.
Hong-Kong: Swindon Book Co., 25 Nathan Road, KOWLOON.
Hungary: Kultura, P.O. Box 149, BUDAPEST 62.
India: Orient Longmans Private Ltd.: 17, Chittaranjan Ave., CALCUTTA 13; Indian Mercantile Chamber, Nicol Road, BOMBAY 1; 36a Mount Road, MADRAS 2; Gunfoundry Road, HYDERABAD 1; Kanson House, 24/1 Asaf Ali Road, P.O. Box 386, NEW DELHI 1. *Sub-Depots:* Oxford Book & Stationery Co., Scindia House, NEW DELHI; Rajkamal Prakashan Private Ltd., Himalaya House, Hornby Road, BOMBAY 1.
Indonesia: G.C.T. Van Dorp & Co., Djalan Nusantara 22, Posttrommel 85, DJAKARTA.
Iran: Commission nationale iranienne pour l'Unesco, avenue du Musée, TEHERAN.
Iraq: McKenzie's Bookshop, BAGHDAD.
Ireland: The National Press, 2 Wellington Road, Ballsbridge, DUBLIN.
Israel: Blumstein's Bookstores Ltd., 35 Allenby Road and 48 Nahlat Benjamin Street, TEL AVIV.
Italy: Libreria Commissionaria Sansoni, via Gino Capponi 26, casella postale 552, FIRENZE.
Jamaica: Sangster's Book Room, 91 Harbour Street, KINGSTON; Knox Educational Services, SPALDINGS.
Japan: Maruzen Co., Ltd., 6, Tori-Nichome, Nihonbashi, P.O. Box 605, Tokyo Central, TOKYO.
Jordan: Joseph I. Bahous & Co., Dar-ul-Kutub, Salt Road, P.O. Box 66, AMMAN.
Korea: Korean National Commission for Unesco, P.O. Box Central 64, SEOUL.
Lebanon: Librairie universelle, avenue des Français, BEYROUTH.
Liberia: J. Momolu Yamara, 69 Front and Gurley Streets, MONROVIA.
Luxembourg: Librairie Paul Bruck, 33, Grande-Rue, LUXEMBOURG.
Malaya (Federation of) & Singapore: Peter Chong & Co., P.O. Box 135, SINGAPORE.
Malta: Sapienza's Library, 26 Kingsway, VALLETTA.
México: E.D.I.A.P.S.A., Librería de Cristal, apartado postal 8092, MEXICO 1.D.F.
Monaco: British Library, 30, boulevard des Moulins, MONTE-CARLO.
Morocco: Bureau d'études et de participations industrielles, 8, rue Michaux-Bellaire, boîte postale 211, RABAT.
Netherlands: N.V. Martinus Nijhoff, Lange Voorhout 9, DEN HAAG.
New Zealand: Unesco Publications Centre, 100 Hackthorne Road, CHRISTCHURCH.
Nicaragua: Librería Cultural Nicaragüense, calle 15 de Septiembre n.º 115, MANAGUA.
Nigeria: C.M.S. (Nigeria) Bookshops, P.O. Box 174, LAGOS.
Norway: S.S. Bokhjørnet, Stortingsplass 7, OSLO.
Pakistan: Ferozsons: 60 The Mall, LAHORE; Bunder Road, KARACHI; 35 The Mall, PESHAWAR.
Panama: Cultural Panameña, Avenida 7.ª n.º T1-49, apartado de correos 2018, PANAMA.
Paraguay: Agencia de Librerías de Salvador Nizza, calle Pte. Franco 39/43, ASUNCION.
Peru: Librería Mejía Baca, Jirón Azangaro 722, LIMA.
Philippines: Philippine Education Co. Inc., 1104 Castillejos, Quiapo, P.O. Box 620, MANILA.
Poland: Ośrodek Rozpowszechniania Wydawnictw Naukowych PAN, Pałac Kultury i Nauki, WARSZAWA.
Portugal: Dias & Andrade Ltda., Livraria Portugal, rua do Carmo 70, LISBOA.
Rumania: Cartimex, Str. Aristide Briand 14-18, P.O. Box 134-135, BUCUREŞTI.
Singapore: *see* Malaya (Federation of).
Spain: Librería Científica Medinaceli, Duque de Medinaceli 4, MADRID. For *The Courier:* Ediciones Iberoamericanas S.A., Pizarro 19, MADRID.
Sweden: A/B.C.E. Fritzes Kungl. Hovbokhandel, Fredsgatan 2, STOCKHOLM 16. For *The Courier:* Svenska Unescorådet, Vasagatan 15-17, STOCKHOLM C.
Switzerland: Europa Verlag, Rämistrasse 5 ZURICH. Payot, 40, rue du Marché, GENEVE.
Thailand: Suksapan Panit, Mansion 9, Rajdamnern Avenue, BANGKOK.
Tunisia: Victor Boukhors, 4, rue Nocard, TUNIS.
Turkey: Librairie Hachette, 469, Istiklal Caddesi, Beyoglu, ISTANBUL.
Union of South Africa: Van Schaik's Bookstore (Pty) Ltd., Libri Building, Church Street, P.O. Box 724, PRETORIA.
United Arab Republic: La Renaissance d'Egypte, 9 Sh. Adly-Pasha, CAIRO (Egypt).
United Kingdom: H.M. Stationery Office, P.O. Box 569, LONDON S.E.1.
United States of America: Unesco Publications Center, 801 Third Avenue, NEW YORK 22, N.Y., *and except for periodicals:* Columbia University Press, 2960, Broadway, NEW YORK 27, N.Y.
Uruguay: Unesco Centro de Cooperación Científica para América Latina, bulevar Artigas 1320-24, casilla de correo, 859 MONTEVIDEO. Oficina de Representación de Editoriales, plaza Cagancha 1342, 1.er piso, MONTEVIDEO.
U.S.S.R.: Mezhdunarodnaja Kniga, MOSKVA G-200.
Venezuela: Librería Politécnica, calle Villaflor, local A, al lado "General Electric", Sábana Grande, CARACAS.
Viet-Nam: Librairie papeterie Xuân-Thu, 185-193, rue Tu-Do, B.P. 283, SAIGON.
Yugoslavia: Jugoslovenska Knjiga, Terazije 27, BEOGRAD.